3-1-1973

A Multi-Sector Simulation Model of Employment, Growth, and Income Distribution in Puerto Rico: A Re-evaluation of 'Successful'Development Strategy

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CENTER DISCUSSION PAPER NO. 174

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March, 1973

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PREFACE

This study attempts to answer two sets of questions. The first set is historical and deals with measuring the historical trends in employment, income and economic growth in Puerto Rico. The second set of questions is directed toward the future economy and asks if the society can depart from historical trends by choosing different development strategy for the coming decade.

The first set of questions focuses on the period from 1953 to 1963, during the creation of industrial activity in Puerto Rico. How had manpower demands by sector and occupation changed as a result of the industrialization? What were the income patterns associated with the new employment? How might employment have grown had the technology, sectoral complexity, or levels of exports been different from the actual historical developments?

In the second set of part of the study, we construct a detailed 42 sector model in order to trace out two types of trajectories: first, simply predicting the composition of society if the historical trends continue; second, altering the strategies and anticipating the impact of these changes on the future society.

The underlying philosophy of this research is that first, a society responds to demands created by industry and that the selection and growth of specific industries is a policy choice. Through differential incentives, it is the conscious and deliberate choice of the government to attract certain industries, first, and then, by means of training grants and special schools, assist in creating the labor force needed by those industries. The projections in this study then serve two different purposes: first, they show the skills, incomes, and range of employment that could possibly

be provided under different paths in the future, and second, they provide criteria against which future population growth and possible employment goals can be compared. The object of the research demonstrates the full range of the consequences of different development policies on labor needs and on income.

To anticipate the conclusions, the models demonstrate the upper limits of continued industrialization. The rate of absorption of manpower in new jobs may be offset by the displacement of labor by increasing efficiency in the agricultural and service sectors. Further export-oriented industrialization and rising productivity may fail to provide a net increase in jobs, leading to the continued reliance on extensive out migration in the next decade. The model and the empirical studies in this research may therefore, be regarded in the framework of indicative social planning, testing out the consequences of different economic policies on the structure of the future society.

PUERTO RICO: THE PATH OF EXPORT DEVELOPMENT

I. Introduction - Background Discussion and Speculation

Puerto Rico's development scheme, generally known as Operation Bootstrap, represents the prototypical case of export promotion as the path to development. After an initial attempt at building and operating its own factories had proved a failure in the late 1940's, the Puerto Rican government opted for a strategy of attracting branches of American companies in order to overcome the Island's poverty. Rising incomes of the Wartime period were then to be sustained in a two stage program. First, Puerto Rico would provide social capital and infrastructure; secondly, "guest companies" would be lured into locating in the industrial sites. The set of incentives which were developed in the industrial promotion efforts have since become the "standard" devices for other low-income regions of the U.S. and for other countries which seek industrialization as the path to development. The specific incentives offered to American industry include a series of promotional devices such as tax exemptions, training grants, and favorable land rental and utility rates, not to mention the island's "natural" advantage of lower wage rates relative to the mainland labor force.

By one set of standards, the efforts to industrialize have been remarkably successful: capital has flowed into Puerto Rico; over 1,700 factories have been built under the promotion schemes, and a stable, productive working force has been created. (See Reynolds and Gregory, 1964; Waggenheim, 1970.) All forms of public services have expanded; port and

transportation facilities have improved; the retail network modernized relative to the inefficient marketing system of the early 1950's. (See Galbraith and Holton, 1955.) The tourist industry has been sucessfully developed, giving an impulse both to large-scale construction and to a permanent service sector. Despite these efforts to keep incomes rising and to develop through export-oriented industrialization, the total number of positions created as a result of the rising incomes has been disappointing. The neglect of the agricultural sector, especially in sugar cane, tobacco, and coffee, has led to the outmigration of large numbers of people who could not be absorbed into the expanding industrial sector. At the same time the industrial promoters were actively devising methods for attracting new industrial capital and increased industrial employment by 90,000 between 1950 and 1970, the agricultural sector -- which accounted for nearly half the labor force in 1950 -- was releasing over 140,000 workers.

In this endeavor, we are suggesting a contradiction to the conventional wisdom on the subject on the "recomposition" of the Puerto Rican labor force. Reynolds and Gregory (1964) suggest that workers engaged in home needlework merely "left" the labor force when the industry departed from Puerto Rico. This is the explanation given for the leveling off of the female participation rate with the introduction of factories. Reynolds and Gregory furthermore suggest that with the rising male wages, women worked less, job expectations of males increased as factory work was provided, and rural workers merely withdrew their labor at low agricultural rates for seasonal migration in the U.S.

We are suggesting that these explanations underestimate the importance of multiple sources of family income. In the pre-war economy, low agricultural wages had been supplemented with household earnings from needlework.

With the demise of the needlework industry and the slow decline of agriculture, the delicate balance of family income was replaced partially by limited, high wage factory employment in other parts of the country. Families of advanced age and non-transferable skills suffered declines in employment, forcing further migration of mobile members. Thus the success of "promoted" industry and of government construction programs gave rise to the illusion of rising real incomes for the employed as the declining rural sectors vented their manpower. The growing standard of living of those employed in the industrial sector of Puerto Rico contrasts with the relative impoverishment of those for whom the employment in "growing" island economy was withdrawn.

Reynolds and Gregory hypothesize that "The main reason for the labor force decline was emigration, with its effects on age and sex distribution of the island." (p. 32) Yet such statements beg the entire question of the mechanism which propelled the emigration, and at the same time, brought about the absolute decline in earnings due to the stifling of certain types of domestic opportunities. The hypothesis that fewer workers would accept a minimal wage for service or agricultural activities may have been true as long as channels to mainland opportunities were opened as alternatives and as urban wages rose. However, the withdrawal of agricultural units from production then released increasing numbers of workers, who were unwilling or unable to accept lower wage rates and who found no alternative jobs created for them in the island economy.

The point here is an historical one. The sugar and tobacco plantations had been developed on the basis of low wages relative to the mainland, and a set of institutional arrangements by which the crop was profitable, the land intensively farmed, and labor extensively used. When, within a decade,

these activities no longer proved profitable, one is impelled to ask what were the specific policies which brought about the change and how they could have been altered in order to preserve domestic employment.

I suspect the answer to this line of inquiry lies in the adoption of what then was the prevailing strategy of development. Industry was brought in on a laissez-faire basis with the state having minimal interference. At the same time, the decision had apparently been made to forego an intensive program for tropical agriculture, the basic economic activity which had been responsible for the generation of wealth and poverty in the past, and which had supported the dense population of the island.

A major political decision had actually been taken: rather than face a reform of the sugar plantations head-on by changing tenure arrangements or by substituting cane with vegetables or citrus fruits, new industry was sought which would not disturb the traditional sectors. Thus the political impasse was sustained, the U.S.-owned sugar companies were not antagonized, and the industry faced a "natural" decline in the absence of more active intervention.

This course of development -- the seeking of industrialization rather than agricultural reform -- amounts to backing away from a revolution rather than the "administration of the revolution," (Goodsell, 1969). The decision, then, resulted in a shift in the mode of production from a rural to an urban proletariat (see Mintz, 1966) while retaining the similar objective of production for export to mainland markets. With this change from land extensive to mechanical factories, the scale of productive units was reduced, altering the competitive position for collective bargaining under the tripartite arrangement, and left the government and public more influential forces for sustaining wage increases.

We thus encounter a major contradiction between income maintenance and job maintenance. In a society in which work itself is taken as the most important factor in the determination of each individual's position in society, it is not enough to say that "per capita income" has risen substantially while employment has barely advanced with population increases. The ability of the unemployed and of those outside the labor force to support themselves through extended family ties or transfers from other regions of the U.S. may be indicative of the divergence between the success of the industrialization and the actual historical process of employment displacement. Since the inability of the economy to provide employment opportunities undoubtedly affects intergeneration mobility and access to public services, it is crucial for us to investigate the sources and causes of job destruction during the process of income creation. It is this task to which we now turn.

II. Activities

A. Overall View -- Summary

The overall set of activities comprehended three major fields of endeavor in this study of Puerto Rican industrialization. The first involved the design and specification of a multi-sectoral model of the Puerto Rican economy. The design of the model required that bodies of data from the pre and post industrialization process be examined in order to capture the fullest detail in the growth model. While annual time series data are available for a large number of aggregate variables, it was decided to emphasize a model in which employment creation at the level of specific skills and occupations could be included for various points during the development process. Thus, the overall goal of the multi-sectoral model was to trace out the sources of job displacement and creation specifically by sector, occupation, and sex, during the process of rapid economic growth. [See Appendix I for a detailed methodology.]

The second field of endeavor was the empirical study of economic change in the fields of manpower and technology in Puerto Rico. These studies included first, the measurement of the comparative job needs a decade apart and the application of a methodology for evaluating job creation; and second, was the comparative study of two inter-industry tables which reveal the full growth and complexity of the industrializing economy. In these inter-industry comparisons, several hypotheses which had been suggested from similar studies of European countries can be examined in light of this particular process. We are seeking to identify the "webs" of specific industries relying on each other and testing the hypothesis that export-led growth may be inhibited in an open economy in which the key industries are

maintained by intermediate imports to the neglect of a strong domestic foundation. (See chapter II of the Progress Report for triangulation and evaluation of input-output tables for 1948 and 1963.)

The third major activity involved in this research endeavor involved the testing of alternative paths and variations on the growth of the Puerto Rican economy. Based on the structure of the Puerto Rican economy in 1963, we proceed to ask a number of counter-historical and projective questions which embody alternative approaches to development. The first path is the continued growth of the export-oriented economy through 1980, altering the gains of productivity. A second major path involves the imposition, by fiat of a strategy of import substitution of several magnitudes. One plan requires that direct consumer goods be produced at home. The second plan requires that intermediate goods used as raw materials for other industries also be produced locally, leaving only basic materials to be imported as inputs. Since Puerto Rico is within the U.S. tariff area, such import substituting industrialization (ISI) schemes could be implemented through a policy of excise taxes and subsidies. The major output of the model through these development strategies emphasizes employment by specific occupational groups generated by the alternative paths. By how much can national income grow when a greater restrictiveness is placed on the openness of the economy?

The third set of counter-factual propositions deals with a number of hypotheses concerning the effect of the redistribution of personal income on economic growth. Both conventional wisdom and a number of economic studies of Latin American countries (Cline on Mexico, Argentina and Venezuela, 1971; Morley and Smith on Brazil, 1971) have suggested that the redistribution of

income of the lower classes might retard growth or at best, have a neutral effect on the economy. The major experiment performed here includes three variations. First, the entire national income is allocated to a certain "standard" consumption characteristic of the middle or average income class. Then two extremes are attempted: the "poorest" consumption pattern is imposed on the nation, then the particular income expenditure pattern of the upper most class is "imposed" as the national norm. In this way, the domestic multiplier effect of particular patterns of demand are evaluated in terms of the national economy.

B. The Characteristics of the Model

The model developed in this research is a variation on conventional comparative static framework typical of input-output analysis. The basic methodology involved the comparison of two thirty-three-order input-output tables, developed for 1948 and 1963 independently. These tables have been extended in such a way as the income flowing to families is distributed by the size of income, attributing family income to the sector of employment of the head of the household. That row which normally appears as a single entry entitled "value added" in conventional input-output analysis has here been extended to include 15 different income classes.

The second major innovation of the model is to incorporate the consumption pattern of each income class specifically in the model. Thus, the result of redistributing income could be fully reflected in alteration in the national composition of demand by these different income weights.

Other models of this type have either incompletely specified the breakdown of consumption for each income class or have tended to apportion

the industrial composition of broad groups of consumer purchases. It is the uniqueness of this model and of the basic detail of the Puerto Rican data which has allowed us to convert budget studies of individual family expenditures into commodity and industrial breakdowns which correspond directly to the inter-industry structure. It is hoped that with the degree of accuracy and precision in the estimating procedure and in the initial data that this model could capture the full effects of changes in consumption patterns and in the standard of living on the domestic economy. A major effort was devoted to the processing of the household expenditure survey in pursuit of this accuracy.

III. Results

A. Historical Model of the Limits of Job Creation

A brief glance at the magnitude of change between 1953 and 1963 in the economy gives us some idea of the limits of the industrialization as a path of development. In this analysis we shall attempt to attribute the weakness of job creation to several distinct sources in order to trace the influence of each. A technique is employed in which the two complete economies for 1953 and 1963 are constructed in constant prices. For each year, the manpower structure, size distribution of income, input-output flows, and vectors of final demands are brought together in a static accounting framework. Each of these "elements" for the later year will be substituted into the model for the earlier, pre-industrial economy, and the change in employment and income "accounted" by the hypothesized substitutions will be estimated.[1] (See Appendix III for detailed methodology.) In comparing the two economies for 1953 and 1963 in Table 1, we note that total employment (line 19) has increased by only 10% during the decade, although considerable change has been experienced in the composition of that labor force. Most striking is the decline of male farm managers and laborers (lines 2 and 8) included within the broader classes, the rise of clerical, sales and craftswomen, as well as the decline in female operatives, service, and laborers. Points of cumulated percentages of families (lines 21-35) and their corresponding income (lines 36-50) are summarized by the Kuznets and Gini ratios (lines 51 and 52), which both indicate increasing concentration of

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[1] This is an exercise popularized in the economic history literature, for example, in an evaluation of the impact of the decline of British exports at the turn of the 19th century on the industrial structure (see Conrad and Meyer, 1964). Also, these techniques are used in study of U.S. technological change (see A. Carter, 1970) in evaluating the hypothetical material input requirements under changing levels of final demand.

family income.

How much more employment could have been generated had the economic structure been "frozen" at its 1953 levels of efficiency and inter-industry structures, but produced enough to meet the 1963 level of final demand? In effect, we are asking that the "old" pre-industrialized economy deliver the level and mix of output demanded in a later decade, as if technological change and productivity had been prohibited. We find (col. 3) that total employment would have risen from 548,499 to 1,006,440 due to a straight forward increase due to changed in level and composition characteristic of the 1963 demand. Female employment would have increased due especially to the operative category. It is interesting to note that with the 1953 productivity levels far fewer female clerical and saleswomen would have been employed in order to produce the 1963 basket of goods. (lines 12 and 13, col. 1 and 3).

The second experiment (col. 4) assumes that the manpower efficiency of 1953 is still frozen, say, by a rigid work rules, but that inter-industry structure advances to 1963 levels. This is a situation of partial technological transformation and growth to meet the 1963 basket of final demands. Total employment is reduced, suggesting that changes in the input-output structure account for a 10% reduction in "potential" employment from the "straight growth" solution. The fourth step in which 1963 technology, productivity and final demand is represented at the 1963 levels is the actual economy. In summary, the step-wise substitution of "pieces" of the 1963 economy allow us to separate the differential impact of "modernization" in the three segments of the economy. The higher overall employment under the "straight growth" case highlights the "potential" employability which,

in some sense, could have sustained a larger island population.

How much reduction in employment was due to changes in productivity alone? At 1953 levels and mix of output (col. 5) 1963 levels of productivity would have resulted in a 20% decline of employment and a further increase in male over female opportunity. This last experiment is a mirror of column 4, the previous experiment which applied 1963 input-output technology and growth to 1953 productivity. These two simulations give us the full range of the impact on employment of the changing productivity. They give us a precise accounting of the cost of modernizing: that new factories without growth would have cut employment by half over levels of growth without productivity increases. Yet it is through growth that the new technology became injected into the labor intensive economy.

In the next section, we shall examine the impact of productivity change specifically by sector and occupation.

TABLE 1

MANPOWER AND INCOME DISTRIBUTION COMPARISON FOR 1953 and 1963

COLUMN / ROW	1 (63 ACT)	2 (53 ACT)	3 (53TYM63D)	4 (53YM63TD)	5 (53TD63YM)
1-PROFLMEN	24782.992	15226.094	30743.934	28780.434	14655.215
2-MANGRMEN	64616.723	67219.000	99139.562	93232.312	46647.828
3-CLERCMEN	28638.297	18823.500	35502.055	28643.129	19347.387
4-SALESMEN	42966.816	34321.406	42710.344	53972.914	27405.801
5-CRAFTMEN	60935.746	47110.969	125082.437	85133.250	35527.152
6-OPERVMEN	63267.453	48280.445	97691.062	81426.812	39048.004
7-SERVCMEN	31118.684	22711.328	46803.598	44698.867	19034.414
8-LABORMEN	145214.937	159597.437	252485.125	183648.937	126983.437
9-NRPTIMEN	4210.664	3402.233	6243.332	5292.477	2853.217
10-PROFLWOM	17246.574	10424.980	22307.324	26150.937	7859.914
11-MANGRWOM	6795.914	4688.117	7340.973	7717.609	4249.117
12-CLERCWOM	30796.816	16097.746	29872.852	25918.715	20128.730
13-SALESWOM	8995.855	4945.316	6089.887	7866.992	5630.969
14-CRAFTWOM	2205.150	673.417	1559.612	1155.326	1373.717
15-OPERVWOM	42097.836	58774.680	125792.250	93182.875	26070.586
16-SERVCWOM	25880.488	30894.180	68081.187	82241.875	10333.844
17-LABORWOM	2464.651	3307.032	5317.234	4084.612	2149.157
18-NRPTDWOM	3964.456	2002.001	3678.510	3136.926	2678.629
19- TOTAL	606199.562	548499.375	1006440.875	856284.562	411976.625
20-MEN/WOMN	3.316	3.161	2.727	2.405	4.119
21-PERS-1	0.108	0.060	0.062	0.075	0.134
22-PERS-2	0.373	0.200	0.195	0.285	0.405
23-PERS-3	0.556	0.348	0.338	0.494	0.581
24-PERS-4	0.664	0.742	0.736	0.879	0.685
25-PERS-5	0.749	0.939	0.938	0.978	0.769
26-PERS-6	0.803	0.973	0.972	0.990	0.822
27-PERS-7	0.876	0.984	0.984	0.993	0.886
28-PERS-8	0.919	0.995	0.995	0.999	0.925
29-PERS-9	0.948	1.000	1.000	1.000	0.951
30-PERS-10	0.962	1.000	1.000	1.000	0.965
31-PERS-11	0.974	1.000	1.000	1.000	0.976
32-PERS-12	0.981	1.000	1.000	1.000	0.983
33-PERS-13	0.985	1.000	1.000	1.000	0.987
34-PERS-14	0.991	1.000	1.000	1.000	0.991
35-PERS-15	1.000	1.000	1.000	1.000	1.000
36-INC-1	0.020	0.011	0.011	0.019	0.027
37-INC-2	0.115	0.057	0.054	0.115	0.128
38-INC-3	0.220	0.123	0.117	0.246	0.234
39-INC-4	0.307	0.413	0.405	0.644	0.324
40-INC-5	0.397	0.718	0.714	0.859	0.416
41-INC-6	0.466	0.825	0.817	0.910	0.487
42-INC-7	0.584	0.871	0.869	0.928	0.597
43-INC-8	0.672	0.942	0.938	0.974	0.683
44-INC-9	0.746	1.000	1.000	1.000	0.752
45-INC-10	0.790	1.000	1.000	1.000	0.796
46-INC-11	0.831	1.000	1.000	1.000	0.836
47-INC-12	0.858	1.000	1.000	1.000	0.863
48-INC-13	0.876	1.000	1.000	1.000	0.882
49-INC-14	0.904	1.000	1.000	1.000	0.908
50-INC-15	1.000	1.000	1.000	1.000	1.000
51-KUZNETS	71.292	65.791	66.028	49.455	72.284
52-GINI	0.466	0.429	0.430	0.363	0.471

Guide to Table 1, "Manpower & Income Distribution Comparison for 1953 and 1963"

rows 1-18: Occupational types for men and women: professionals, managerial, clerical, sales, crafts, operatives, service, laborers, & "not reported."

row 19: Total employment.

row 20: Ratio of male/female employment.

rows 21-35: The share of persons in each of the income classes.

rows 36-50: The share of income received by each of the income classes, cumulated.

Thus, rows 21-50 give the information for plotting the Lorenz curve for income distributions. The Lorenz curve is summarized in the following summary measures:

row 51: Kuznets coefficient is the sum of the absolute differences of the shares of income and the shares of families receiving the corresponding income share. The coefficient ranges from 0 for perfect equality to 2.00.

row 52: Gini ratio, ranging from "0" for perfect equality to "1" for maximum inequality

COLUMNS:

1: Indicates the employment and income distribution for the economy in 1963.

2: Indicates results for the 1953 economy.

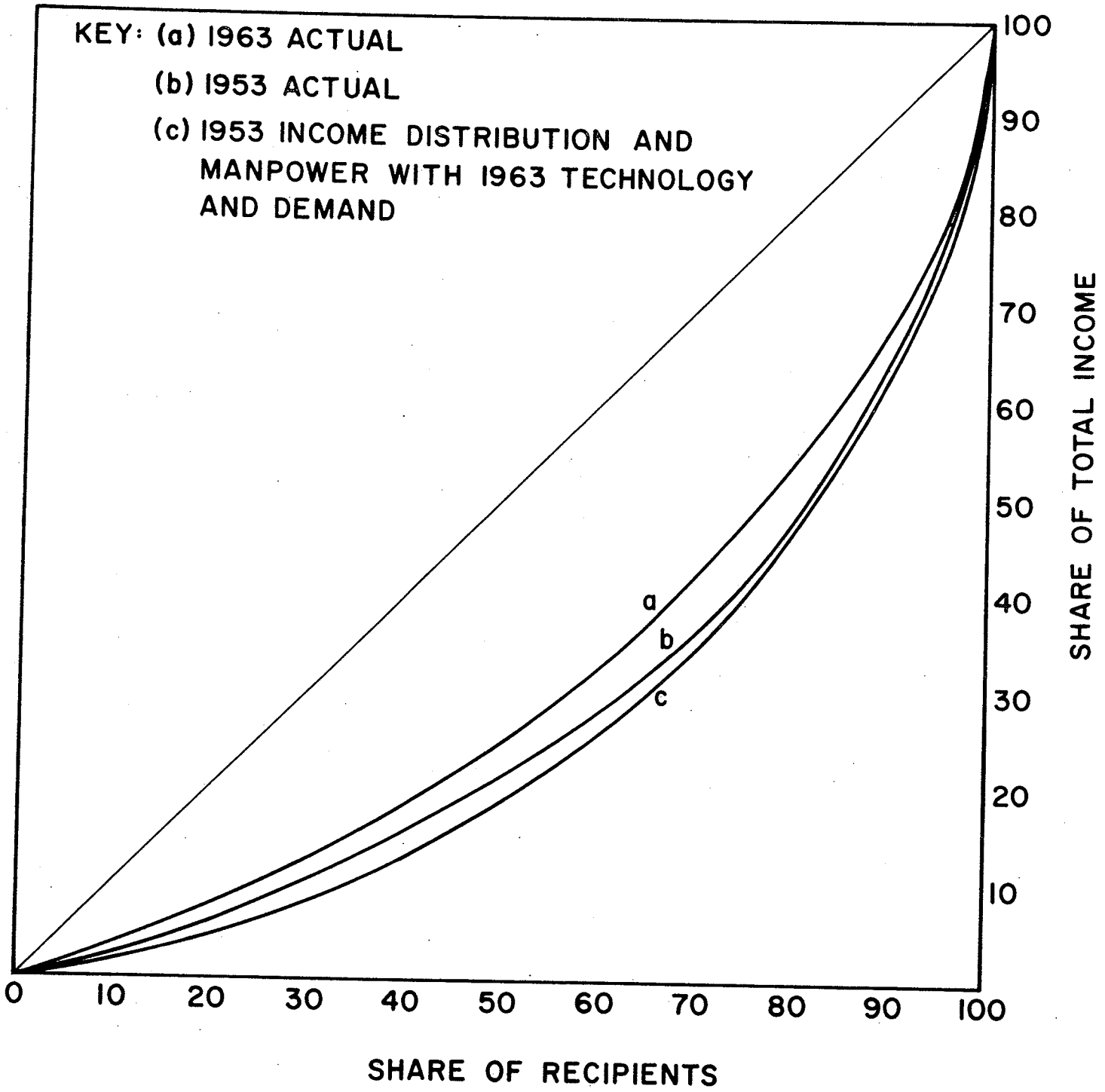
3: Indicates results for
(T) 1953 Technology (input-output table)
(M) 1953 Manpower (labor coefficients)
(Y) 1953 Income Distribution
(D) given 1963 level and composition of Final Demand.

4: Indicates results for
1953 Income Distribution (Y)
1953 Manpower (M)
given technology (T) in the input-output table
1963 Demand (D)

5: Indicates results for
1953 Technology (T)
1953 Demand (D)
given 1963 Income Distribution (Y)
1963 Manpower (M)

Column codes:
T inter-industry technology.
Y income distribution to families by sector.
M manpower coefficients: full-time employees per output by sector and occupation
D demand by sector for consumption, investment, government, etc.

LORENZ CURVE FOR THREE POINTS IN TIME



B. Productivity Changes During Industrialization

1953-1963 Manpower Comparisons:

The impact of industrialization is distinctly demonstrated in changes in manpower utilization. We hypothesize increasing productivity of the labor force, as demonstrated by a change in the occupation distribution of the labor force as a shift toward higher skill levels.

To evaluate the impact of macro-economic variables on the development and composition of the labor force, we have relied on two rather basic measures for sectoral and occupational distribution of the labor force. The first is a measure of productivity, defined as manpower per dollar of output, and measured by the relative difference of production between 1953 and 1963 weighted by the sector's (or occupation's) share of total manpower. The second measure is the relative difference of manpower flows between 1953 and 1963 weighted by total employment of the sector's or occupation's share. What is important is the comparison of the two, which yield the following possibilities: 1) an increase in productivity accompanied by an increase in employment, indicative of a newly developing sector; 2) increasing productivity and declining employment indicative of a maturing industry; 3) decreasing productivity and increasing employment which might indicate sectors absorbing unemployment or engaged in producing social overhead capital; 4) finally, declining productivity and declining employment.

We find that trade, construction and personal services fall into our first category of newly developing sectors. The trade sector displays the most demonstrative change in both productivity and employment, resulting

from the expansion of the monetized sector of the economy, or in other terms, the organized expansion of the commercial sector. The construction sector shows signs of significant, though less dramatic changes, which may be attributed to the construction of new hotels and homes as well as the more obvious construction of manufacturing and distributive facilities. The increasing productivity of the personal service sector is more difficult to interpret, though the increasing employment can easily be attached to repercussions of a developing middle income class.

The second category of maturing or transformed sectors is delineated by and confined to the agricultural and textile and apparel sectors. The agricultural sector's dramatic increase in productivity and equally dramatic decrease in employment illustrates the sharp transformation of the agricultural sector, which reflects the destruction of the low-productivity sugar economy and the moderate shift to higher productivity dairy enterprises. The textile and apparel sector, which in the early 1950's was still largely a "putting out" system, also went through an intense transformation as it moved into the modern factory system.

Lastly, the government sector has been transformed into employing more people at lower levels of productivity. This is part may be explained by the growing provision for educational, medical and welfare services. But it is also accounted for by the fact that the government was trying to absorb some of the unemployment, and some difference may be due to accounting conventions as well.

The picture that this data conveys is that of a small country experiencing a modicum of industrial development, with the greatest impact being on which might broadly be called the distributive and service sectors.

The low profile of traditional industrial development in the overall picture begins to indicate the limitations of Fomento's industrialization schema. But before beginning to draw any firm conclusions, it might be useful to look at the other side of this picture, i.e., industrializations impact on the occupational distribution of changes in productivity and employment.

Looking at Table 2 , which provides us with an occupational breakdown of relative changes in employment weighted by total flows, we find a significant shift away from male laborers and managers and female operatives toward male operatives, craftsmen, salesmen, clerical men and professionals, and toward clerical and professional women. The shift in men results from the move out of agriculture and into the trade, construction and government sectors. Women, on the other hand, are moving out of the non-factory textile and apparel sector and into government (teachers and welfare workers), commerce and other service sectors.

The changing occupational composition of the Puerto Rican labor force suggests a slight upward movement, in the skill component, though heavily weighted toward service rather than industrial skills. This confirms our earlier notions of a rapidly transforming economy initiated by some industrialization, but primarily organized around service rather than production industries.

TABLE 2

RELATIVE DIFFERENCES IN MANPOWER COEFFICIENTS
AND FLOWS BY OCCUPATION WEIGHTED BY TOTAL MANPOWER FLOWS

1953-1963

	Men	Flows by Occup	Coef by Occup
1.	Professional	-.165	.0012
2.	Managerial	.045	.130
3.	Clerical	-.170	.017
4.	Sales	-.149	.044
5.	Craft	-.239	.087
6.	Operative	-.259	.093
7.	Service	-.145	.022
8.	Laboring	.249	.696
9.	Not Reported	-.014	.0004
	Women		
10.	Professional	-.118	.006
11.	Managerial	-.036	.001
12.	Clerical	-.254	.016
13.	Sales	-.070	.0014
14.	Craft	-.026	-.00005
15.	Operative	.288	.0762
16.	Service	.086	.0241
17.	Laboring	.014	.0002
18.	Not Reported	-.033	-.0003

NOTE: Negative number denotes an increase in employment (Flows) from 53 to 63 and a decline in productivity (Coef)

TABLE 3

RELATIVE DIFFERENCES IN MANPOWER COEFFICIENTS
AND FLOWS BY SECTOR WEIGHTED BY TOTAL MANPOWER FLOWS

1953-1963

		Flows by Sector	Coef by Sector
1.	Agriculture	.520	.720
2.	Sugar Mill	-.036	-.003
3.	Other Food	.031	.006
4.	Textiles & App.	.270	.068
5.	Wood Furn.	-.017	.0004
6.	Printing	.008	.0006
7.	Chemical	-.006	.0007
8.	Non-Metal	-.020	.0004
9.	Metal & Mach.	-.148	.0014
10.	Other Manufac.	-.102	.0033
11.	Mining	-.020	.0001
12.	Construction	-.216	.060
13.	Trade	-.420	.276
14.	Transport	-.076	.0184
15.	Commun.	-.057	.0003
16.	Fin. Reals	-.090	-.0009
17.	Personal Serv.	-.057	.102
18.	Business Serv.	-.096	.0015
19.	Hotel	-.098	.0051
20.	Utilities & San.	-.036	.0014
21.	Public Admin.	-.368	-.109

NOTE: Negative number denotes an increase in employment (Flows) from 53 to 63 and a decline in productivity (Coef)

CHART 1

RELATIVE DIFFERENCE IN MANPOWER/$ OF OUTPUT COEFFICIENTS
BY OCCUPATION WEIGHTED BY TOTAL MANPOWER FLOWS
1953-1963

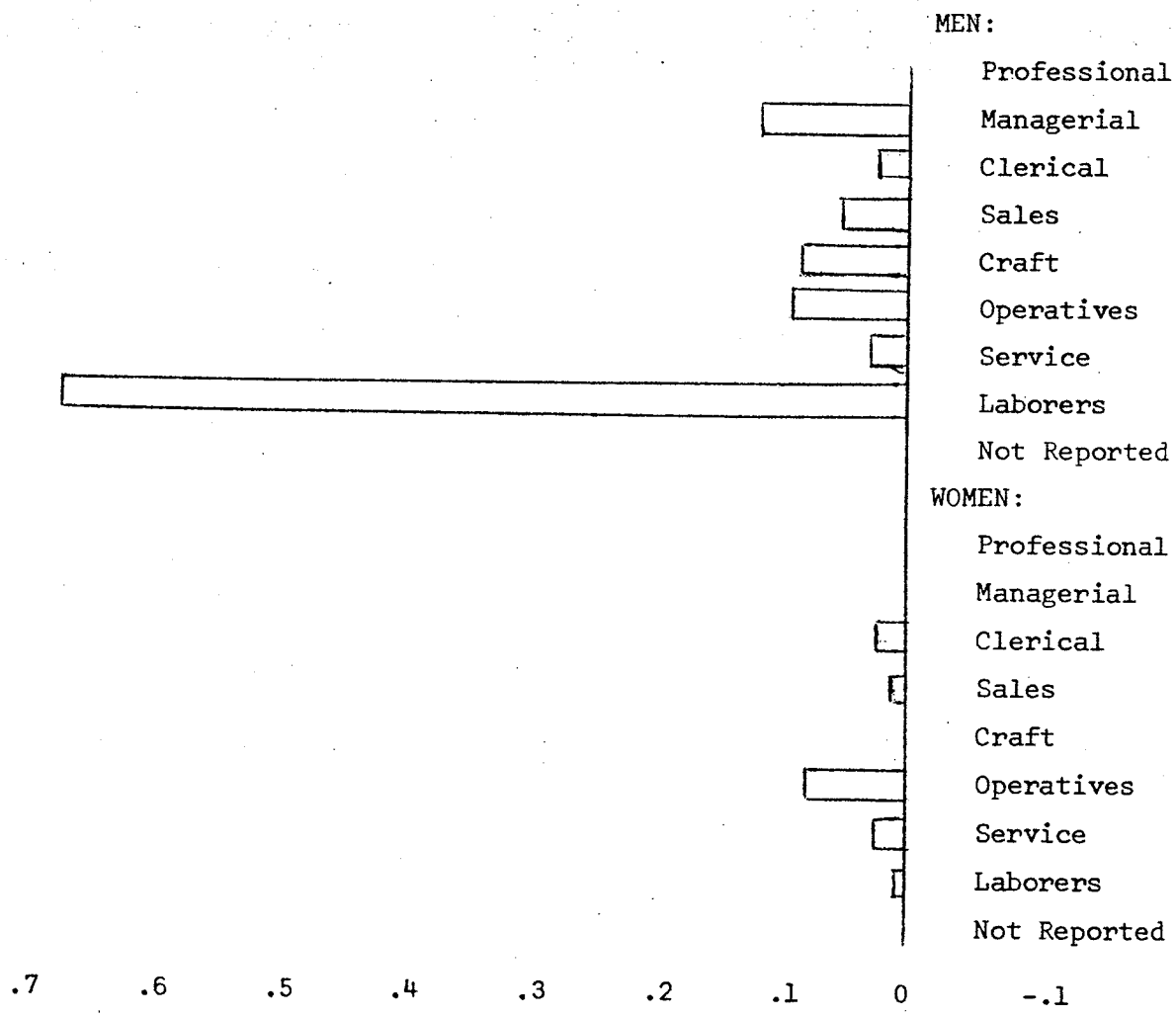


CHART 2

RELATIVE DIFFERENCE IN MANPOWER BY OCCUPATION
WEIGHTED BY TOTAL MANPOWER FLOWS
1953-1963

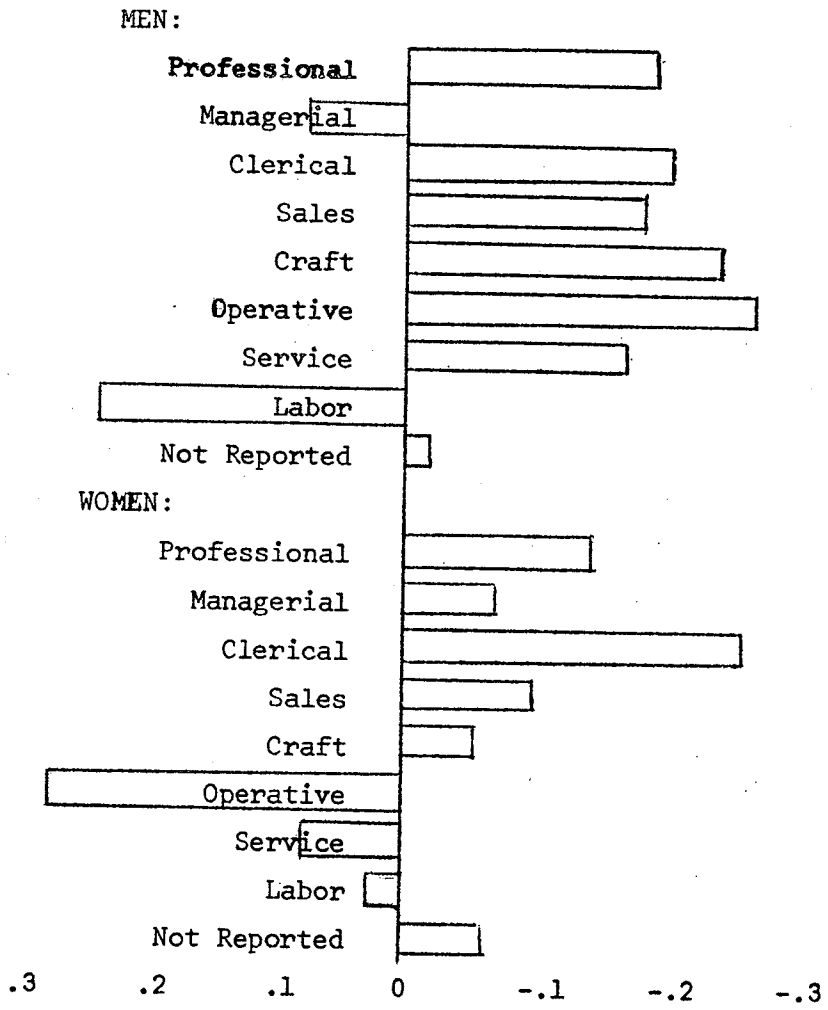


CHART 3

RELATIVE DIFFERENCE IN MANPOWER BY SECTOR
WEIGHTED BY TOTAL MANPOWER FLOWS
1953-1963

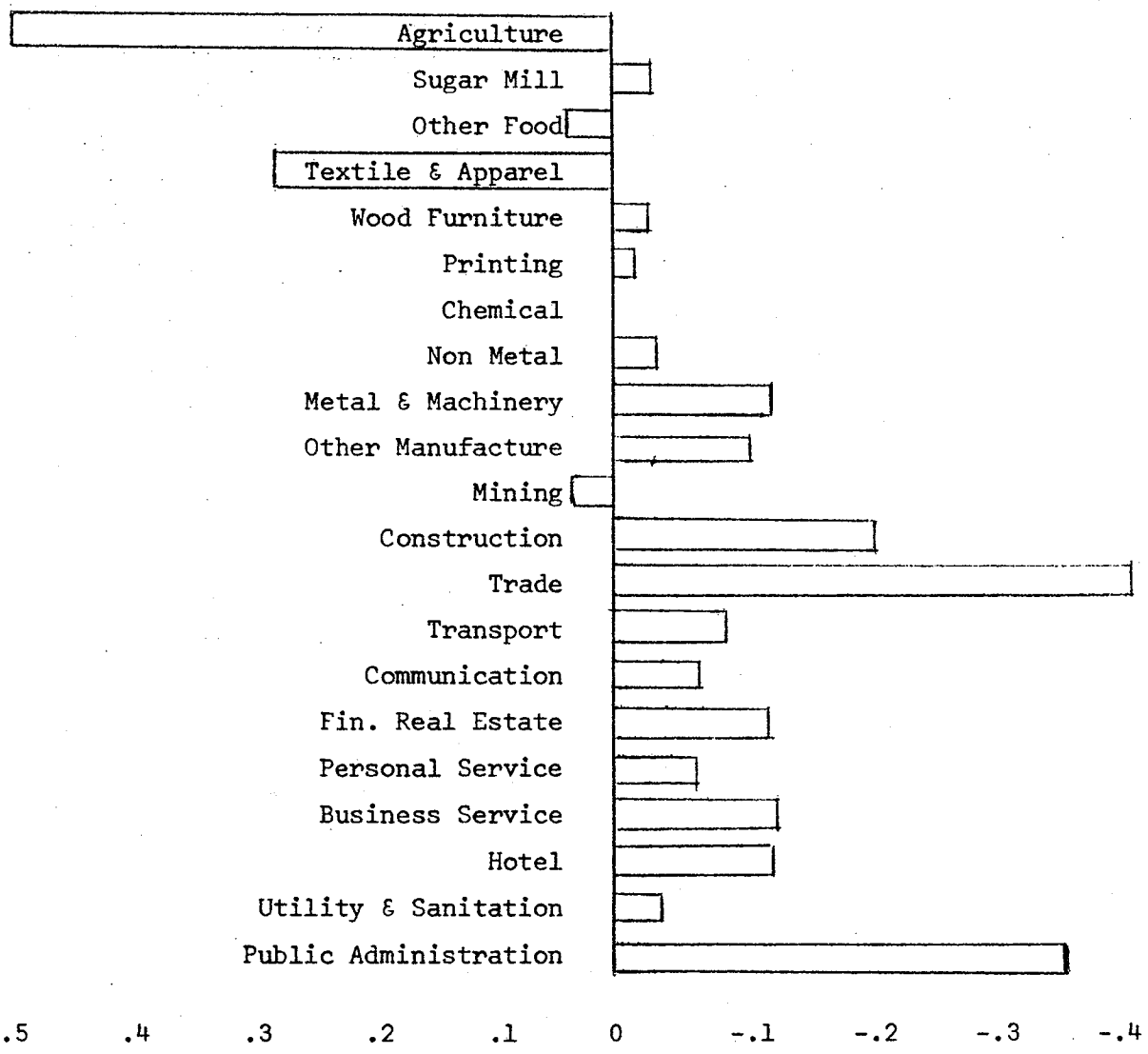
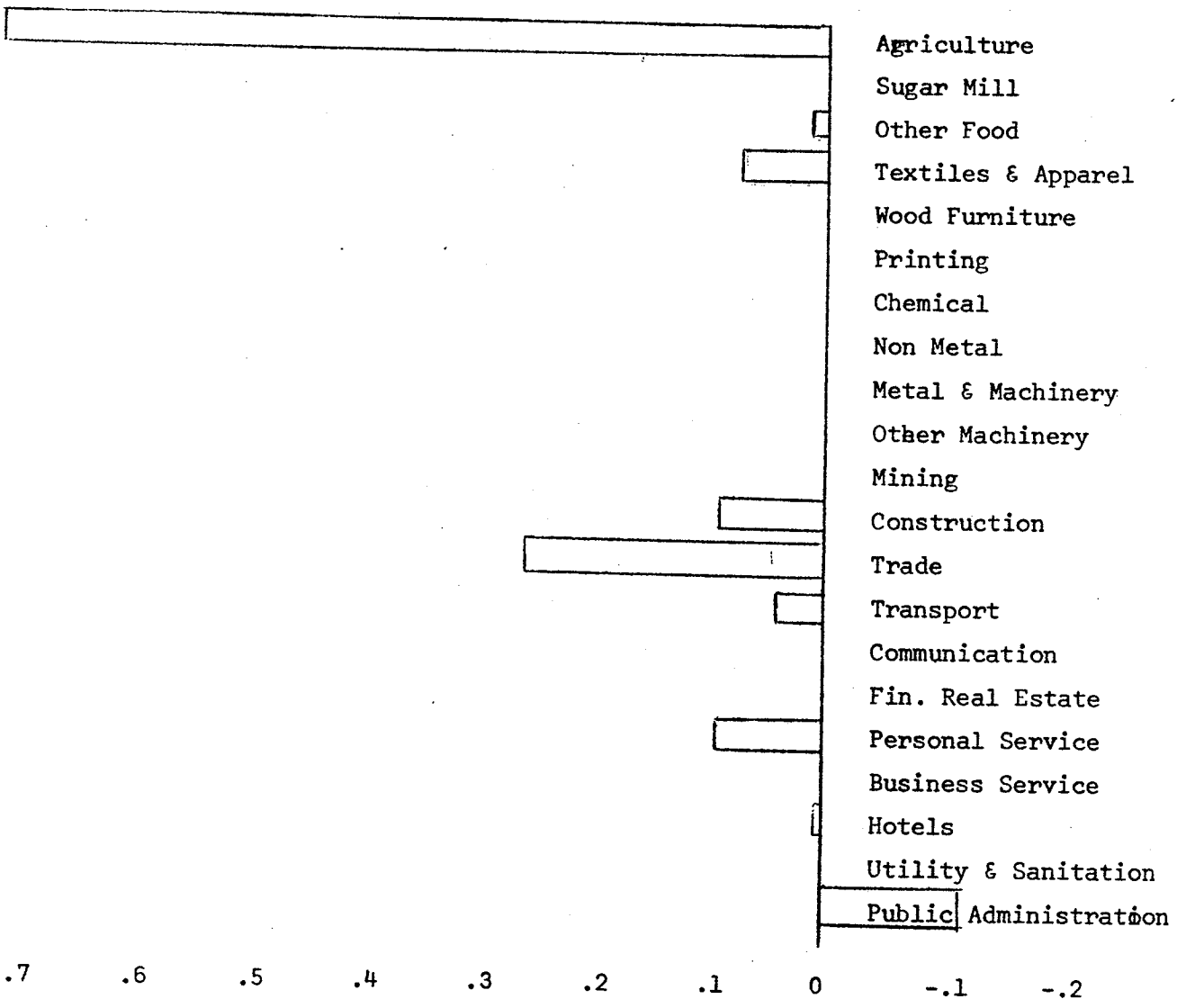


CHART 4

RELATIVE DIFFERENCE OF MANPOWER/$ OF GROSS DOMESTIC OUTPUT
BY SECTOR WEIGHTED BY TOTAL MANPOWER FLOWS
1953-1963



Technical Note: Definitions of Relative Differences

Weighted Relative Differences: Coefficients

purpose: to devise a measure that will demonstrate the impact of technological change on the labor force of Puerto Rico. First, accepting the manpower/$m output as a crude measure of productivity, the relative difference between 1953 and 1963 will give us a measure of the change in productivity between the two years without overstating the development of new sectors. To determine the impact that this change in productivity had on the labor force we weight the productivity change by the sector's average share of the labor force for 1953 and 1963. The same was done for manpower/$m output by occupation.

$$\frac{n_{i63} - n_{i53}}{\frac{n_{i63} + n_{i53}}{2}} \quad X \quad \frac{n^{*}_{i53} + n^{*}_{i63}}{N^{*}_{53} + N^{*}_{63}} = n_{iw}$$

reduces to

$$\frac{2(n_{i63} - n_{i53}}{n_{i63} + n_{i53}} \quad X \quad \frac{n^{*}_{i53} + n^{*}_{i63}}{N^{*}_{i53} + N^{*}_{i63}}$$

where n equals the 'manpower/output' coefficient for the ith sector (or jth occupation) for given year

n^{*} equals the manpower flow for the ith sector (or jth occupation) for the given year

N^{*} equals the total manpower flow for all i sectors (or j occupations)

n_{iw} equals the weighted relative difference for the ith sector (or jth industry).

Weighted relative differences: flows of manpower

purpose: to demonstrate each sector's (or occupation's) contribution (positive or negative) to the change in employment between 1953 and 1963. This in turn can be computed with the weighted relative difference of coefficients to pinpoint the sources of employment creation and labor displacement over the ten year period.

The relative difference of the manpower flow by sector (occupation) is weighted by that sector's (occupation's) share of the mean total labor force. This may be stated algebraically as:

$$\frac{\frac{n^*_{i63} - n^*_{i53}}{\frac{n^*_{i53} + n^*_{i63}}{2}}}{\frac{\frac{n^*_{i53} + n^*_{i63}}{2}}{\frac{N^*_{53} + N^*_{63}}{2}}}$$

which reduces to:

$$\frac{2(n^*_{i63} - n^*_{i53})}{N^*_{i53} + N^*_{i63}}$$

IV. Policy Implications

A. Alternatives Paths: Export Development Versus Import Substitution

The "success" of the export-promoting industrialization has resulted in a significant change in the composition of the Puerto Rican labor force and the economy's output. Furthermore, the potential for the flexible adoption of growth policies of other than export development may have been reduced by virtue of the chosen strategy. The goal of this section is to examine the consequences of the export-led industrialization as a path to development and compare its successes to some alternative strategies which might in the future be selected by Puerto Rican policy makers.

Our objective first is to evaluate the employment accomplishments by comparing the actual trajectory of growth to some alternatives. In this way, we are posing the counterfactual question, "what would have resulted if a different set of paths had been followed?" Since the actual set of policies are embedded in the input-output relationships and in the occupational distribution of our simulation model, we shall alter some of the historical "choices" and test out the consequences of those choices in terms of employment and income. (The mechanical operations involved in these adaptations are described in the technical appendices.)

1. Counterfactual Results:

We proceed by asking two counterfactual questions in detail: first, how would the economy have developed if, while pursuing export promotion, an attempt had been made to constrain the growth of imports? Secondly what would have been the further implication on economic growth of a more aggresive policy of income redistribution.

The first type of policy could have been carried out by imposing

varying degrees of excise taxes on selected commodities, as has customarily been applied on luxury goods and consumer durables for the purpose of raising revenue. These duties, however, could be applied in order to encourage the domestic production of a number of traditionally imported goods. While these policies might result in some short term rise in relative prices of domestically produced goods, the model will test only for the net income-generating effect of import substitution at competitive equilibrium prices.

2. Import Substitution:

In developing a set of import substitutes, we assumed first that the government was able to develop a program to reduce the household sector's consumption of imports by 20% while imposing no restrictions on interindustry procurement. This resulted in an 8% increase in national income. On the other hand when we impose the same restrictions on inter-industry procurement as on household consumption (i.e., 20% overall import reduction) we found a more dramatic increase in national income and a corresponding increase in employment and value added to families between 26% and 27% greater than the 'actual' program. The comparison of the two schemes in some sense demonstrated the high dependence of Puerto Rican industry on imported inputs from the mainland, and the full multiplier effects of more complex domestic production.

Next, we posited a more traditional concept of import substitution, that of the conscious development of domestic industries capable of competing with inputs from the mainland. In this experiment attention is focussed on the agricultural, foodstuff and textile-apparel sectors. In so doing, we assumed that the household sector had no option other than to consume domestic products from these sectors (i.e., 100% import substitution of household consumption for sectors 1 through 13). We further assumed that inter-industry

procurement of goods from these same sectors could be no more than 10% of what it had been (i.e., a 90% import substitution of intermediate demand for sectors 1 through 13). There was no alteration of the import-domestic mix in the remaining sectors. This experiment resulted in a base year growth of national income almost identical to that generated by 20% overall import reduction scheme, again between 26% and 27% spurt of growth.

Input-output simulation imposes a static quality which inhibits the demonstration of the full negative and positive impact of the above experiments over time. Thus the impact that the import substitution schemes had on the base year 1963 is identically mirrored in the annual calibrations. Nevertheless, the dramatic results of both the 20% overall and select-import substitution schemes on national income in the base year is highly suggestive of the additional dynamic gains which might result from a more rationally-selected mix of export promotion and import substitution.

3. Income Redistribution: The Egalitarian Society with Different Consumption Patterns

On the 20% import substitution model was further imposed the assumption of an egalitarian society. Income was redistributed such that families received the mean income and spent their income in a pattern similar to the mean income class. The several changes in the economic performance were not as dramatic as might have been thought, since the new equilibrium yields little more than a 1% reduction in national income over the straight import substitution scheme with different income classes intact. These results could be explained by the high degree to which the mean income class characterized the overall consumption behavior of the Puerto Rican population.

In separate experiments, the expenditure patterns of lowest (class 1) and the highest income classes (class 15) were imposed on the population while maintaining an egalitarian of mean income level for all families. This experiment was performed in order to test the sensitivity of the economy to the allocation of family expenditures between different sectors while maintaining the same level of family spending. By adopting the consumption pattern of the lowest income class as the norm, national income rose by 26% over 'actual' program which was only 1% higher than the "class 5" experiment and a slightly lower increment than the program of 20% overall import substitution without altering the income distribution. When the consumption pattern of the highest income class (15) was imposed on the egalitarian society, national income fell but only by five-tenths of a percent from the 'actual' level. These results suggest that the level of economic activity is not significantly affected by income redistribution, at least as a consequence of the static effects on domestic consumer demand.

Table 4

RESULTS OF IMPORT SUBSTITUTION AND INCOME REDISTRIBUTION SCHEMES
1970

DEVELOPMENT STRAGEGY:	Totals		Absolute Increases		Percentage Increases	
	Employment	Income Per Capita	Employment	Income Per Capita	Employment	Income Per capita
	('000)	($)	('000)	($)	('000)	($)
	(1)	(2)	(3)	(4)	(5)	(6)
1. Actual economy, 1970	715.5	1,357	----	----	----	----
2. Import substitution: 20% Household consumption only	774.2	1,467	58.7	111	8.2	8.1
3. Import substitution 20% Household and intermediate demands	900.1	1,720	184.6	364	25.8	26.8
4. 'Selected' import substitution: 100% HH and 90% intermediate demands, sectors 1-13	919.3	1,710	203.7	354	28.5	26.1
IMPORT SUBSTITUTE 20% OVERALL THEN REDISTRIBUTE TO MEAN INCOME WITH:						
5. Consumption pattern, class 5	881.1	1,727	165.6	371	23.2	27.3
6. Consumption pattern, lowest class 1	892.5	1,703	177.0	346	24.7	25.5
7. Consumption pattern, highest class 5	896.5	1,687	181.0	330	25.3	24.3

B. The Testing of Industrial Policy: Employment Projections.

If Puerto Rico continues growing over the coming decade as it did in the past decade, what will be the level of employment by 1980? Furthermore, what effect will continued growth have on the occupational distribution of the labor force?

These series of experiments was devised to assist in the prediction of the continuation of current growth policies on the society. The model here is essentially an extension of a final demand model, in which the levels of exports and exogenous investment are predicted into the future on the basis of current trends, and their effects on inter-industry flows, employment, consumption, and the consumption feedbacks which are captured within the economy.

How sensitive are the levels and types of employment to the particular mix of exogenous demands? Does the society have much of a choice in its ability to create jobs for an increase in population?

The calibration procedure of the model was undertaken at first by a simple projection of total annual employment by separate industries from 1963 to 1970 by means of applying those segments of final demand which are

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[2] The key assumption of the model built into the fixed coefficients is the infinite elasticity of supply of labor for different skill classes. This may not be too unrealistic, given the availability of a mainland managers and the return migration. No attempt in this study has been made to evaluate the impact of wage differentials between mainland in attracting or severing jobs. Thus the model is for all purposes demand-run which assumes that labor is trained and appears instantaneously in order to fill the positions that have been created by the alternative "paths." Thus the overall view taken in the model is that the particular set of promoted industries generate jobs directly and indirectly, and the full impact of predictions along this line must be estimated to give a realistic view of the structure of jobs in the next ten years.

considered to be exogenous to the economy. The discrepancies between a simple straight line projection of employment and actual employment in those years, were ascribed to changes in productivity between 1963 and 1970. The properly calibrated employment for 1970, which accounts for increasing productivity, came within 2 percent of actual employment by sector during the eight year period. Using these averages of increasing productivity and finding that during this period exogenous final demand grew at the rate of 12.7% a year, we chose three alternatives for the overall growth of final demand, 1980-I: less than the historic rate of growth (10% a year) which generated an employment level of 829,000, 1980-II: the historic rate of growth (12.7% a year) employing 1,094,000, and 1980-III: greater than the historic rate (15% a year) with 1,351,000 employed. The employment generated by these assumptions can be seen in Table columns 9-11. The annual rate of growth of total employment resulting from the three alternatives are 1.6%, 5.3% and 9.0% respectively.

We then chose to alter the major components of exogenous final demand in order to judge the sensitivity of the economy to different levels which may be effected by policy, namely, construction investment and non-government exports which together account for almost 70% of exogenous final demand. In these projections we let all other components of final exogenous demand grow at the overall historic rate (12.7%) while permitting either construction investment or non-government export to grow at a rate of growth different from the overall historic rate. In the first case we assumed that the construction boom which highlighted Puerto Rican development in the 1960's continued at its same pace (16.7% a year) and then we projected an intensification so that the sector reflected an average annual rate of

growth of 20%. The results are recorded respectively in 1980-IV and -V in the same table, and demonstrate an average per annum employment growth rate of 6.6% and 7.8% respectively.

Finally, we assume that accelerated export promotion is pursued in addition to the historically growing construction boom. When the demand for exports is projected at its historic rate (11.6% per annum) it generates annual average rate of increase in employment of 4.5%. On the other hand when we permit export demand to grow at 14% per annum over the decade of the seventies, an average annual rate of growth of employment of 6.2% is generated.

What do these alternatives demonstrate? First, they provide us with a measure of variability of the level of employment that might be expected to prevail in Puerto Rico by 1980. Predicted employments ranges from 829 thousand to 1358 thousand people, which is encompassed by the high and low historical paths. Less obvious, but more interesting is the fact that while construction investment has historically (i.e., between 1963 and 1970) grown faster than exports, and has been respondible for the generation of greater absolute employment, there is another side to the picture. If we compare the additional dollars of final demand with the employment generated for construction investment and non-government exports, while holding all other variables constant, we find that over the period from 1970 to 1980 one million dollars of additional construction investment generates 68 jobs while an additional million dollars of non-government exports generates 74 additionally employed people.

From our results no attempt has been made to evaluate the annual salaries of these different number of jobs. However, ff the job creation is

stated as a social goal, then it is suggested that export promotion does offer a higher initial employment multiplier than does construction investment, and the reader is urged to regard the particular composition of skills and occupations as suggestive of what the alternative societies will look like in terms of equality and range of incomes.

While development strategy must necessarily be oriented at least in part toward employment creation, at the same time policy makers cannot ignore the need to increase the skill component of the labor force. On this basis it is useful to consider the impact that the alternative growth paths are projected to have on the occupational distribution of the labor force. This is demonstrated in Table 6 .

First we find that the historical overall rate of growth and the two variants (less than, and greater than the historical rate) generate almost identical occupational distributions of employment. However, compared to the 'calibrated' 1970 distribution, the changes are striking. The most significant change is the sharp fall in laboring men and somewhat smaller decline in managerial men, which is associated with a further deterioration of the agricultural sector. The slack is taken up by service men and women, and by women operatives with some additional increase registered by the more skilled clerical and professional women and professional men. The net effect is a relative increase in female employment as shown by a continuing decline in the men/women employment ratio from 2.6 to 2.2. In all, the pattern emerging from the balanced growth path implicit in historic 1980 is one of a slight increase in the skill level of the labor force. But most important is the continuing growth of service sector employment

relative to other occupations.

The construction boom, as might be expected, generates slightly less favorable employment opportunities for women, assuming no major change in the structure of jobs. Compared to the 1980 'historic' projection of the occupation distribution of employment (see Table 7) the men/women ratio rises from 2.2 to 2.4 thereby reversing the equating trend of balanced historic growth. This rise is largely accounted for by the fall in women operatives and the concomitant rise in laboring men and craftsmen.

Alternatively, export oriented growth, as depicted in 1980-VII indicated a slight improvement in the men/women ratio when compared with 'historic' exports 1980-VI and the true 'historic' 1980-II paths. This tendency can be traced to the increase in female operative and reflects the importance of women in the export-oriented manufacturing sectors.

Two tentative conclusions may be drawn from these findings. First, the impact of export promotion relative to a continuing and intensified construction boom, facilitates a movement toward equality between male and female employment opportunities. At the same time, export promotion induces no dramatic changes on the occupational distribution of the labor force, thereby implying no significant changes in the labor forces's skill composition.

Second, the data suggests that an export program tested in this limited experiment would have a greater employment multiplier (employment generated per dollar of final demand) than either the historic growth or the construction boom. The corresponding impact of a construction program on the occupational distribution is only slightly more evident than with export promotion. Most discernable is a small movement away from more highly skilled occupation, from professionals to sales people, and a

corresponding increase at lower skill levels especially among craftsmen and laboring men.

Table 5

ASSUMPTIONS UNDERLYING THE ALTERNATIVE EMPLOYMENT PROJECTIONS BY OCCUPATION FOR 1980[+]

Projection Scheme (1)	Annual Growth Rate Of Overall Exogenous Demand 1971-80 (2)	Annual Growth Rate of Specific Components of Exogenous Demand	
		Construction Investment (3)	Export (4)
Balanced Growth:			
1980-I	10.0%	10.0%	10.0%
1980-II	12.7%*	12.7%	12.7%
1980-III	15.0%	15.0%	15.0%
Construction Boom:			
1980-IV	12.7%	16.7%*	12.7%
1980-V	12.7%	20.0%	12.7%
Export Promotion:			
1980-VI	12.7%	12.7%	11.6%*
1980-VIII	12.7%	12.7%	14.0%

NOTES: [+]a procedural description may be found in the technical appendices. See Appendix I, page 33.

*denotes the historic annual rate of growth from 1963 to 1970.

TABLE 6

PERCENTAGE DISTRIBUTION OF EMPLOYMENT BY OCCUPATION

FOR 1980 PROJECTIONS

	Actual	Balanced Growth			Construction Boom		Export Promotion	
	1970	1980-I	1980-II	1980-III	1980-IV	1980-V	1980-VI	1980-VII
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Men:								
Professional	5.1	5.9	5.9	5.8	5.8	5.7	6.0	5.8
Managerial	9.5	8.5	8.6	8.6	8.4	8.3	8.5	8.6
Clerical	5.7	6.4	6.3	6.3	6.1	5.8	6.4	6.2
Sales	7.4	6.9	7.0	7.1	6.8	6.6	6.9	7.1
Crafts	12.3	12.6	12.5	12.5	13.7	14.8	12.7	12.3
Operative	11.4	11.4	11.6	11.6	11.6	11.7	11.4	11.8
Service	6.4	7.5	7.4	7.3	7.1	6.8	7.5	7.2
Laboring	13.7	8.6	8.5	8.5	9.1	9.7	8.6	8.4
Not Reported	.7	.7	.7	.7	.7	.7	.7	.7
Women:								
Professional	3.7	4.5	4.5	4.5	4.4	4.4	4.5	4.5
Managerial	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Clerical	6.2	7.1	7.0	7.0	6.7	6.5	7.1	6.9
Sales	1.5	1.3	1.4	1.4	1.3	1.3	1.3	1.4
Crafts	.4	.5	.5	.5	.5	.4	.5	.5
Operative	8.3	9.3	9.4	9.4	8.9	8.4	9.0	9.8
Service	5.6	6.8	6.8	6.8	6.7	6.7	6.8	6.7
Laboring	.2	.2	.2	.2	.2	.2	.2	.2
Not Reported	.7	.7	.7	.7	.7	.7	.7	.7
TOTALS	100.0	100.1	100.2	100.1	99.9	99.9	100.1	100.0
Percentage Increase in Employment over 1970	--	15.9	52.8	89.9	65.7	77.9	45.5	61.8
Men/Women	2.6	2.2	2.2	2.2	2.3	2.4	2.2	2.1
Kuznets	70.613	70.618	70.617	70.616	70.528	70.420	70.612	70.622

TABLE 7

CALIBRATED EMPLOYMENT BY OCCUPATION: ALTERNATIVE PROJECTIONS FOR 1980
adjusted for productivity changes

COLUMN	8	9	10	11	12	13	14	15
	(1970)	(1980-I)	(1980-II)	(1980-III)	(1980-IV)	(1980-V)	(1980-VI)	(1980-VII)
ROW								
1-PROFLMEN	36720.5	49200.5	64323.1	79458.2	68866.1	73877.4	62179.1	66797.3
2-MANGRMEN	67930.4	70506.5	93820.0	117174.7	99912.1	106632.2	88922.7	99722.8
3-CLERCMEN	40576.4	52708.4	68799.8	84900.2	71799.6	75108.7	66641.8	71400.9
4-SALESMEN	52921.2	57166.2	76702.1	96279.6	80780.7	85279.9	72020.2	82345.2
5-CRAFTMEN	88179.5	104225.3	136892.2	169613.6	162358.9	190450.9	132288.4	142441.4
6-OPERVMEN	81487.5	94825.4	126403.9	158051.2	137619.6	149991.6	118180.9	136315.2
7-SERVCMEN	45728.7	61978.0	80826.4	99684.6	84271.2	88071.2	78301.1	83870.3
8-LABORMEN	97828.7	70950.7	92856.9	114798.5	108387.7	125519.6	89148.5	97326.6
9-NRPTDMEN	5143.3	6108.5	8052.5	9999.1	8675.8	9363.5	7680.9	8500.3
10-PROFLWOM	26528.6	37374.6	49140.7	60921.0	52732.2	56693.8	47107.5	51591.4
11-MANGRWOM	8682.0	10267.8	13605.7	16948.7	14237.8	14935.0	12895.5	14461.7
12-CLERCWOM	44396.6	58489.7	76454.4	94450.4	79678.8	83235.6	74027.7	79379.4
13-SALESWOM	10796.3	11124.3	15027.7	18940.7	15907.6	16878.2	14001.3	16264.8
14-CRAFTWOM	3069.8	3862.6	5172.3	6484.9	5415.0	5682.6	4779.4	5645.9
15-OPERVWOM	59276.4	77417.2	102449.9	127528.2	105247.2	108333.0	93414.9	113339.7
16-SERVCWOM	39793.1	56035.4	73908.7	91808.5	80015.8	86752.6	70417.4	78116.9
17-LABORWOM	1698.3	1370.2	1808.5	2247.7	1941.2	2087.6	1687.5	1954.4
18-NRPTDWOM	4739.2	5553.4	7325.3	9099.8	7923.1	8582.6	6968.4	7755.5
19-TOTAL	715496.0	829144.4	1093569.0	1358385.0	1185769.0	1287473.0	1040663.1	1157337.0
20-MEN/WOMN	2.6	2.2	2.2	2.2	2.3	2.4	2.2	2.1

TABLE 8

COEFFICIENTS OF THREE CONSUMPTION PATTERNS FOR 49 SECTORS

Row	(EXPND 1)	(EXPND 5)	(EXPND 15)
1-AGRICNEC	0.0468	0.0370	0.0268
2-SUGRCANE	0.0	0.0	0.0
3-SUGRMILL	0.0166	0.0172	0.0136
4-ALCOHBEV	0.0155	0.0222	0.0198
5-NONALBEV	0.0154	0.0070	0.0025
6-BEERMALT	0.0870	0.0250	0.0151
7-DAIRYPRD	0.0392	0.0307	0.0214
8-BAKEDPRED	0.0100	0.0113	0.0093
9-LIMPFOOD	0.0816	0.0517	0.0320
10-TOBACPRD	0.0040	0.0027	0.0020
11-TEXTILES	0.0043	0.0037	0.0084
12-APPAREL	0.0228	0.0139	0.0087
13-LEATHER	0.0025	0.0025	0.0025
14-WOODNEC	0.0001	0.0001	0.0001
15-FURNITUR	0.0253	0.0156	0.0069
16-PAPERPRD	0.0016	0.0011	0.0007
17-PRINTING	0.0057	0.0043	0.0029
18-CHEMICAL	0.0182	0.0113	0.0073
19-PETROCOAL	0.0214	0.0212	0.0167
20-MINERLPR	0.0014	0.0008	0.0004
21-PRIMMETL	0.0001	0.0001	0.0001
22-FABRMETL	0.0010	0.0010	0.0009
23-MACHYNEC	0.0011	0.0010	0.0009
24-ELECMACH	0.0107	0.0073	0.0053
25-TRANEQPT	0.0056	0.0051	0.0066
26-SCIINSTR	0.0083	0.0049	0.0028
27-OTHRMANU	0.0083	0.0065	0.0052
28-MINING	0.0	0.0	0.0
29-CONSTRUC	0.0	0.0	0.0
30-TRADE	0.0	0.0	0.0
31-EXCISETX	0.0	0.0382	0.0465
32-IMPTDUTY	0.0038	0.0028	0.0018
33-TRANSPOR	0.0022	0.0549	0.0638
34-COMMUNCN	0.0008	0.0041	0.0044
35-BANKING	0.0	0.0	0.0370
36-INSURANC	0.0015	0.0033	0.0067
37-RLESTATE	0.1592	0.0920	0.0473
38-PERSSERV	0.0173	0.0149	0.0168
39-BUSNSERV	0.0002	0.0001	0.0000
40-MEDSERV	0.0058	0.0238	0.0251
41-SERVSNEC	0.0	0.0345	0.1006
42-HOTELS	0.0	0.0034	0.0150
43-RECREAT	0.0	0.0217	0.0277
44-ELEC+GAS	0.0226	0.0132	0.0069
45-WATR+SAN	0.0068	0.0042	0.0024
46-COMLGOVT	0.0016	0.0016	0.0012
47-HHINDTRY	0.0	0.0066	0.0140
48-FEDLGOVT	0.0115	0.0121	0.0114
49-MUNCGOVT	0.0000	0.0000	0.0000
50-TOTALS			

Conclusions: Summary and Future Policies

This research has been directed toward a multi-pronged inquiry of a fundamental historical irony of the development process. By successfully pursuing a stragegy of industrialization and the extensive importation of capital, Puerto Rico has achieved one of the most remarkable gains in real growth and rising incomes among developing regions. However, high levels of unemployment have persisted despite massive outmigration during this era. The object of this research effort has been to obtain a more comprehensive understanding of the process of net job destrucution and the "recomposition" of Puerto Rican society during the era of job creation and industrialization.

A. Historical Model of the Limits of Job Creation

The historical study of the 1953-1963 economy led to a quantitative evaluation of the relative importance of changes in (a) productivity, (b) inter-industry technology, and (c) final demand on "potential" levels of employment. Our goal was to evaluate the degree to which the efforts at growth and thereby the attainment of higher standard of living were undercut by the deletion of work opportunities. The process of expansion -- at least in terms of the particular strategy of industrialization -- led to the undermining of the employment objective in favor of an income objective. From our comparative analysis of the pre-industrial (1953) to the "modern" (1963) economy, we concluded that net job creation could have increased from a base of 548,000 in 1953 to some 1,006,000 jobs by 1963 had the original 1953 technology been preserved in order to meet the 1963 level of final demand. This hypothetical alternative corresponds to a set of policies which would have maintained the early technology through the importation of used equipment, subsidizing the earlier, more labor-using techniques, despite any

cost savings inherent in using the latest technology of new mainland plants.

The change in the inter-industry flows from 1953 to 1963 accounts for a reduction in the hypothetical employment from 1,006,000 to 856,000. Direct increases in productivity explain the remaining "loss" of jobs to the 1963 actual levels of employment of 606,000. The irony in the path ultimately taken, of course, is that the efforts at income growth were the very devices which worked against the projected achievements of that growth. The only optimistic observation can be made with regard to even further losses in employment through the failure to grow; that is, the economy might have suffered even more severe labor dislocations. Our historical model suggests that technological changes without growth would have resulted in 412,000 jobs as a hypothetic minimum. With this as a standard of comparison the actual 1963 level of 606,000 does appear as a major achievement, especially compared to the situations in other parts of the Caribbean: areas growing less slowly yet suffering from the unemployment effects of advanced technology.

To summarize, the 1953-63 model utilized a methodology which defines the limits of net job displacement and creation for the aggregate economy. The attainment of these levels in the course of the decade was accomplished through major changes in a few sectors and occupations. These are examined in the historical study of productivity and manpower changes.

B. Productivity and Manpower Changes During Industrialization

Despite the importance given the industrialization program, changes in sectoral and occupational manpower needs are dominated by the non-industrial activities. The major declining sectors in agriculture and home needlework released labor of two sorts: first, unskilled male laborers, who worked as rural proletariat in cane, as sharecroppers, and self-employed farmers, engaged

in other types of cultivation; and second, women operatives. The economy then gained in the more highly skilled male positions, such as crafts, sales, clerical and professional, while female employment rose first in the clerical and professional categories, and second in the sales and managerial positions.

This "reconstitution" of the Puerto Rico labor force as a different sorting of positions would lead us to inquire further into the real extent of mobility and the final destination of the displaced laborers. A portion of the agricultural laborers did find positions in construction and public service, while the women transferred into domestic services or left the active labor force. In any case, the "reshuffling" of the skill mix corresponds to the rising inequality of income and the widening gap between the traditional occupations and the newly demanded ones. Finally, we are suggesting simply that the shifts in demand for certain skills left large groups without sources of income and without transferable abilities within Puerto Rico. These groups then were forced to seek positions for their marketable labor in the mainland, as farm laboeres or as unskilled hands in services or factories. Thus the change in the needed skills in Puerto Rico corresponds to the simultaneous undercutting of the lowest income classes with no comparable alternatives provided locally and the creation of more highly paid groups.

Finally, it should be noted that despite the fanfare of the "Operation Bootstrap," the industrial sectors accounted for relatively little of the increase in net employment, although the impact on income generation is probably not exaggerated. When the measures of changing manpower and productivity levels are weighted by the share of the labor force, we find that the most important sectors which sustained rising employment and rising productivity were trade, construction, and personal services. Both the apparel and

agricultural sectors released significant quantities of labor in the face of increasing productivity, while the government sector absorbed manpower in the face of declining productivity.

We conclude that as far as net employment generation is concerned, the "modern" industrialization fails to comprehend the employment displacement which affected the rural proletariat, and that the net employment absorbers were not the "new" industrial sectors at all, but the terciary sectors of government, trade, personal services, and construction. Focus of further studies should be on these sectors, especially the effects on "unsuspected" labor displacement which is likely to result from increasing efficiency in the retail distribution system, from the introduction of prefabricated techniques in construction, or from the "streamlining" of public services.

C. The Integration of Manpower and Industrialization Strategies: The 49 Sector Model

1. Alternative Paths of Industrialization

The construction of a demand-oriented model allowed us to test the impact of alternative paths of development on employment and on the level and distribution of national income. The fundamental proposition tested by means of the model was that the society responds differentially to the particular policy of growth: specifically, that export promotion as a path for growth led to unnecessarily extensive labor displacement and a skewed income distribution.

As an alternative, a policy of import substitution was first "imposed" on the model of the Puerto Rican economy from 1963 to 1970. A program of domestic production of 20% of final and intermediate goods which are currently

imported, it was found, would have resulted in the increment of national income by 26 to 27%. It was found that a similar gain in growth could also have been accomplished by "selectively" import substituting thirteen consumer goods sectors which traditionally have been the first to be produced locally in exchange-constrained economies.

The second major finding from experimentation with the model was the relative inertness of national income to radical changes in the redistribution of income. A third finding was that the labor intensity of current consumption patterns may be inconsistent with the achievement of an egalitarian society. That is, the imposition of the consumption pattern of the uppermost income group as the "norm" for the society led to a slightly lower level of national income and a higher level of total employment, while imposition of the consumption demands of the lowest income class resulted in a lower employment at slightly higher levels of income. The "service intensive" consumption of the upper income class is significant as an empirical as well as projective finding. As an empirical statement, the result of the model implies that the growth of an affluent upper class -- implicit in the skewness of income -- lends some stability to an already difficult labor situation, while the growth of the lower classes has resulted in even greater release of manpower by virtue of the commodity-intensive composition of their consumption. Ironically, the pursuit of more egalitarian consumption during the growth in Puerto Rico -- say through sterner income taxes -- would have led to even weaker labor absorption and greater out-migration than did occur.

The implications of the model in some sense parallel the experience of other Caribbean societies: that industrialization and the failure of agriculture led to inequality in the income distribution through massive disemployment, at one extreme and the growth of relatively high incomes at the other. Part

of the newly created labor reserve is "sopped up" domestically in the terciary sector, and part remains unemployed or inactively dependent.

2. Projections to 1980 and Speculation

The simulated effects of continued "balanced growth" were contrasted with the effects of simulating an even greater export boom on the one hand and a construction boom on the other. The projections to 1980 reveal the superiorit of the construction boom in generating more jobs per dollar of national income as well as the creation of additional places in the less skilled occupations.

The key philosophy underlying the projections of the model maintains that the society can control its own path of development. To continue the present course of creating employment, with minor variations tested in the simulations, suggest no major differences between the alternative projections. All results suggest the continued "replacement" of the male unskilled laboring class by a more highly skilled female labor force. This implies the probability of continued outmigration of substantial numbers of unemployable men.

If the national goal is to provide jobs for all the current labor force in the present island terrain, then a wholly radical strategy of development may be needed which builds on rather than rejects the current industrial structure. The current dilemma lies in the direction of future activity.

We are suggesting that the pursuit of an import substitution policy and the ending of export promotion may serve to fulfill the employment goal and may easily be attainable given the array of manufactures currently produced in Puerto Rico. Other developing countries have found that the import substitution phase of industrialization is a relatively simple accomplishment due to accessible technology and transferability of simple skills. It is the integration "backward" into more sophisticated, primary production and the exportation of industrial products which has proved a difficult stage

for developing countries.

Puerto Rico, however, approaches the development trajectory in reverse. Having created a skilled labor force and having already captured several complex phases of production, the classic difficulties of import substitution have been overcome. What remains is to move forward in the production process, and to design an operational set of incentives which fit into the current market arrangement with the U.S. and which encourage the substitution of imports by domestic production. One major drawback may lie in the anticipation of price rises in the import substituted industries as local production "learns" to compete with international imports. Import-substituting production could be first "protected" to a minor degree through an excise tax on "luxury models" of imports. This would serve to reduce the proliferation of styles and models made common through the franchise links with the U.S. and would simplify the demand for basic manufactured commodities. Differential tax programs could be applied to attract the "needed" industries and the payment of income taxes could serve to subsidize less competitive industries in the reduction of prices to match international levels. Finally, the increase in wage income itself will generate government revenue by means of increments in personal income taxes and consumption excise taxes. The magnitudes of the subsidies to import substituting industries can be constrained to equal the additions to the Commonwealth revenue due to new taxes collected as a result of increasing employment. It is in this direction -- the use of the planning model to maximize domestic employment subject to stable rather than increasing income levels and which envisions major new directions in the economic structure -- that further empirical research must be directed.

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